ENVIRONMENTAL DEFENSE
finding the ways that work

Attachment 1: Description of Emissions Reduction Measure Form

Please fill out one form for each emission reduction measure. See instructions on attachment 2.

Title: Inclusion of the California Cement Industry in a multi-sector cap-and-trade program regardless of whether energy efficiency improvements and increases in the use of blended cement products occur as a result of discrete early action measures.

Type of Measure (check all that apply):

☐ Direct regulation
☐ Monetary Incentive
☐ Voluntary
☐ Other Describe:
☑ Market-based compliance:
☐ Non-monetary incentive
☐ Alternative Compliance Mechanism

Responsible Agency: California Air Resources Board, Cal-Trans, Local Planning Agencies and Building Departments

Sector:

☐ Transportation
☐ Other Industrial
☐ Agriculture
☐ Sequestration
☐ Electricity Generation
☐ Refineries
☑ Cement
☐ Other Describe:

2020 Baseline Emissions assumed (MMT CO2 eq): 13.523 MMTCO2eq (see below)

1990 Emissions from combustion = 3.133
1990 emissions from process = 5.099
1990 combined emissions= 8.232 (excluding electricity)

2004 emissions from combustion = 3.908
2004 emissions from process = 6.043
2004 emissions form electricity = 0.8
2004 combined emissions = 10.751 (including imbedded emissions in electricity used)

2020 emissions from combustion, process and electricity use : 13.523 MMTCO2 eq. This is assuming an average annual growth rate of 2.0%[1] above the 3 year average for combined

[1] 2.0% growth rate from "Reducing CO2 Emissions from California's Cement Sector", October 14, 2005, Center for Clean Air Policy

emissions from 2002 – 2004[2]. This baseline emissions rate does not account for reductions achieved from discrete early action measures associated with energy efficiency improvements or increases in the use of blended cement.

Percent reduction in 2020:

See below

Cost effectiveness ($/metric ton CO2E) in 2020:

See below

Description:

Environmental Defense firmly believes that emission reductions from the 11 in-state cement plants should be achieved by inclusion in a multi-sector cap-and-trade program. Under a multi-sector cap-and-trade program, CARB would set a total allowable limit on emissions from all sectors that are within the cap. Regulated entities would then be required to submit allowances equal to their emissions during each compliance period. Therefore, since the overall cap would be less than the current aggregate emissions, individual plants would be required to either reduce on-site emissions, purchase reductions from other capped facilities, or purchase qualified offsets.

Emissions from the California cement industry generally come from two sources, the combustion of fuels and the manufacturing of clinker. Since the production of cement requires large amounts of heat and electricity, (primarily from coal combustion) the industry is very energy intensive and a single plant produces a sizeable amount of greenhouse gases. In 2007, the California Market Advisory committee recommended that combustion and process emissions from the states cement plants be included in a multi-sector cap-and-trade system for emissions reductions. We agree with that recommendation.

Emission reduction calculations and assumptions:

Calculating the overall emissions reductions (cap): The emissions reductions required under a multi-sector cap-and-trade program are determined by the extent to which the cap is below the actual level of emissions in covered sectors. One of the best aspects of a cap is that it is a limit on the total allowable emissions from sources covered in the cap. Other regulatory approaches, such as performance-based standards, may limit emissions associated with a given activity, but do not limit the amount of activity and thus do not put a limit on total emissions. Furthermore, by observing allowance prices in the marketplace, the real costs of economy wide emissions mitigation can be observed and used to inform future adjustments to the cap.

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[2] Electricity emissions assumed constant at 0.8

Similarly, the real costs of ratcheting the cap downward can be observed via changes in allowance prices.

We recommend a stringent multi-sector cap that is derived from an aggregation of sector-specific emissions reductions goals. CARB should also consider factors such as the size of the overall cap-and-trade market, the percentage of statewide greenhouse gas emissions that are under the cap, and the availability of offsets and linkages to beyond California in setting the cap. Ultimately, of course, the reductions required under the multi-sector cap-and-trade program, combined with reductions achieved through other measures, must equal or exceed the amount of reductions needed to reduce statewide greenhouse gas emissions to 1990 levels by 2020.

Estimating sector-specific emissions reductions: Several factors affect the calculation of an emissions reductions estimate for each sector. First, the number of emitting entities within each sector and cost curves for potential emissions reductions from that sector will help determine emissions reduction potential. Also, the contribution each sector makes to the overall California emissions inventory and cap-and-trade market is relevant. In addition, any sector-specific estimates rely, in part, on the historic emissions data for that sector. Further, the impact of other regulations applicable to each sector, along with cost and competitiveness factors unique to each sector, must also be assessed.

Potential for emissions reductions using energy efficiency, fuel switching and blended cement scenarios: Environmental Defense worked with NRDC to develop a scenario analysis tool for determining the potential economy wide emission reductions associated with implementing a combination of technologies (energy efficiency, fuel switching, and blended cement) within the cement sector. This tool may be used both to establish a performance benchmark for setting the cap on cement facilities under a cap-and-trade program as well as setting cement production emission standards (as NRDC suggests). Environmental Defense believes that cement production emission standards are a useful way to develop complementary policies that capture non-GHG emissions and are protective of local health concerns.

Cost effectiveness calculation and assumptions:

Economy wide cost effectiveness: There is a difference between a cost-effectiveness metric calculated as the costs per unit of emissions reduced and the idea of a program that is achieving reductions goals as least cost. Cap-and-trade policy ensures the latter. A cap-and-trade program creates incentives for emissions sources to find the least-cost options to achieve emission reductions. In a multi-sector cap-and-trade program, emissions sources have the option of pursuing on-site reduction strategies, purchasing emission allowances from other entities in any other sector under the cap that have been able to beat their own targets, or purchasing qualified offsets from entities not within the cap. This means that trading within and between sectors allows for market participants to seek out and implement the most cost-effective reductions strategies. The cost of emissions reductions achieved under a cap-and-trade program will be lower than the cost of those same emissions reductions achieved through an alternative policy instrument.

The total cost to society of meeting an emissions reduction goal is equal to the emissions mitigation costs incurred by the regulated entities plus the regulatory costs of administering and enforcing the program. Cap-and-trade programs typically involve lower regulatory costs than traditional command-and-control programs for at least two good reasons. First, there is no need for regulators to conduct detailed and time-consuming assessments and rulemakings about specific control technologies, such as establishing Best Available Control Technology measures. Second, the regulated entities have a financial incentive to demonstrate compliance because they can sell unused emissions credits.

Individual site and measure cost effectiveness: A major benefit of trading is that no *a priori* calculation of cost effectiveness by CARB will be needed because market participants will be incentivized to do this calculation internally for their unique reductions options and to then compare their internal options with the market-clearing price for emissions allowances. While the cost effectiveness of specific emission reduction strategies can be calculated as the cost of implementation divided by the amount of reductions achieved, with trading it is not clear that a specific reduction strategy will be used. This "flexible compliance strategy" makes moot the need to determine in advance which abatement methods will be best for individual facilities. Also, a cap-and-trade program eliminates the need for government agencies to estimate which strategies will be used at the facility level because the cap-and-trade program allows individual facilities (who are the ones best positioned to have that information) to weigh their options and then act in a manner that is in their best economic interest.

***Creating sector-specific cost curves*:** To determine how trading might evolve and to forecast allowance prices, we are actively researching sector-specific cost curves and will provide this information when complete.

In order to determine what the costs to facilities will be using marginal abatement curves, it is important to understand the relative differences on potential for emissions between the facilities in each sector. One way to achieve this is through the use of benchmark emissions criteria. These benchmarks establish facility level indexes on emissions by using industry wide data. However, as explained below, benchmark criteria have not been developed for any industry.

Implementation barriers and ways to overcome them:

Variable facility characteristics create a challenge to creating marginal cost curves: It is useful to have facility-level knowledge of the marginal costs of emissions abatement. This information can be an important tool for determining emission reduction potential and likely trades between facilities (and sectors). Facility and sector-specific marginal abatement cost curves are also useful for forecasting the economy-wide costs of meeting a reductions goal.

Lack of industry data: Lack of facility-level information about marginal abatement cost curves should not be seen as a barrier to implementing a cap-and-trade program. Under a multi-sector cap-and-trade system, CARB does not choose technology winners or the mitigation

strategies at the facility (or for a sector). Rather, the market system allows facilities to determine the most cost effective manner to make reductions and rewards them for beating the standard. Further, under an offsets program, facilities are rewarded for the emissions reductions they can achieve beyond that required under mandatory regulations. This incentive to innovate and go beyond the regulatory mandate is one of the most attractive advantages of cap-and-trade policy over other mechanisms.

Although specific strategies to reduce emissions from cement plants are well known, the extent to which these strategies can be implemented in the state of California is not. These "energy efficiency" strategies include replacing process equipment and production methods with more efficient equipment and methods. Other strategies for reducing greenhouse gases involve using less GHG intensive fuels and developing methods to reduce the amount of clinker needed to make a given amount of cement. Finally, though not widely discussed in the literature, methods to decrease the overall demand and use of cement in the construction and transportation industry have been proposed.

The primary reason for the data gap on implementation potential is a large variability in the extent that energy efficiency and GHG reduction projects have already been implemented across the state. For example, in 2001, several members of the US cement industry through the Portland Cement Association joined the US EPA climate leaders program and agreed to reduce CO2 from cement production by 10 percent per ton of cementitious product. In California, although only one cement company is a member, other plants have recently undertaken efficiency and kilns replacement projects to increase clinker production without reducing GHG emissions. Further examples pointing to the uncertainty in the extent of emissions reduction opportunities available in the state are presented by the use of waste tires in kiln fuel of some plants but not others, and the degree to which blended cements and WAFFLEMAT™ technology will be accepted within the building and transportation community.

Implementation of discrete early action measures: The overlay of a series of discrete early action measures within the California cement industry should not affect the ability of the cement industry to be included in a cap-and-trade program to reduce emissions. Rather, reductions achieved by directed regulations will be counted in the amount of reductions needed to achieve a plant's compliance obligation under the market system.

Costs and competitiveness: Cement plant equipment modifications and upgrades can require a large amount of start-up capital. Further, switching from coal to lower GHG intensive fuel like natural gas carries increased of operation. Though cost curves for California plants have not been determined, GHG reduction measures can be prohibitively expensive if they impact the profitability and competitiveness of California plants when compared to foreign cement manufacturers. To overcome this barrier, CARB should could design the market system emissions allowance distribution method to specifically account for the cement sector. Further, CARB should facilitate increased access to public benefit programs that give aid to businesses for reducing GHG and energy use.

Energy costs are uncertain: Cement plants purchase a large amount of electricity from utilities. Therefore, being involved in a multi-sector cap could affect the price of electricity sold to cement plants. The potential for increased efficiency at regulated facilities in all sectors may ultimately have a positive impact on energy costs. Regardless of the price differentials, energy costs should not be seen as an implementation barrier.

Potential for leakage from out of state: The inclusion of the state cement industry in a multi-sector cap-and-trade program and a price on carbon associated with emissions from facilities may cause a shift towards less production in the state in favor of more fuel imports. The cause of this shift would likely be related to a change in the profitability of manufacturing cement in state. CARB must be aware of the potential for this effect and develop methods to limit its occurrence.

Co-pollutant emissions: As discussed below, emissions from cement plants include harmful co-pollutants. Primarily, these emissions are associated with the combustion of coal and the calcining of limestone. For this reason, CARB should consider new or more strict minimum standards for cement plants in addition to inclusion in the cap-and-trade.

Potential impacts on criteria pollutants

Emissions from the cement industry include criteria pollutants, hazardous air pollutants, and global warming pollutants. These pollutants come from the combustion of fuel for heat and steam, primarily from coal use. As with many other industries, strategies that reduce global warming pollutants (e.g. improved energy efficiency of existing equipment, improved process control, improved maintenance and tuning of equipment, and installing new equipment) lead to reductions of co-pollutants because they lead to reduced coal use. However, due to the lack of information on the extent to which specific technology has already been implemented in California, quantifying emissions reductions of co-pollutants from specific measures is unknown.

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